# Air Quality in Alberta
# July to September, 2001

Alberta Environment continuously monitors air quality in Edmonton (three stations), Calgary (three stations), Red Deer, Fort Saskatchewan and Beaverlodge (35 km west-northwest of Grande Prairie). Air pollutants monitored at Alberta Environment stations include carbon monoxide, dust and smoke, oxides of nitrogen, ozone, total hydrocarbons, hydrogen sulphide, sulphur dioxide, ammonia and particulates ($PM_{10}$ and $PM_{2.5}$). The Index of the Quality of the Air (IQUA) is calculated at the Edmonton, Calgary, Red Deer and Fort Saskatchewan stations. The

A converts air pollutant concentrations into ***Good***, ***Fair***, ***Poor*** and ***Very Poor*** air quality ratings.

## Highlights

- **Air quality was rated as *Good* over 93 per cent of the time at Alberta monitoring stations from July to September 2001.** ***Good*** air quality was reported over 99 per cent of the time at the Calgary and Edmonton Central monitoring stations. The frequency of Good air quality ratings was close to the long-term average at most stations. ***Good*** air quality is the best possible rating and means that there are no known harmful effects to human or environmental health.

- **Only one hour of *Poor* air quality was reported in the third quarter of 2001.** ***Poor*** air quality was reported from 3 to 4 p.m. on the afternoon of August 3 at the Edmonton East monitoring station. This Poor air quality occurrence was caused by an ozone concentration of 0.083 ppm (parts per million) that was just slightly higher than the one-hour guideline of 0.082 ppm. The ambient temperature recorded at the Edmonton East station on the afternoon of August 3 was 32.9 °C. Under hot weather conditions, elevated ozone levels can occur due to a complicated set of chemical reactions involving oxides of nitrogen and volatile hydrocarbons in the presence of sunlight. In Edmonton and Calgary, ozone levels exceed the one-hour guideline only once or twice a year. This guideline can be exceeded up to 20 hours per year in southern Ontario. Elevated ozone levels lead to pollution alerts issued in southern Ontario several times every year.

For current air quality conditions call ***427-7273*** in Edmonton and ***250-2099*** in Calgary.

Alberta
ENVIRONMENT

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- ***Very Poor* air quality did not occur at Alberta monitoring stations from July to September 2001.** *Very Poor* air quality is rare in Alberta with no occurrences reported over the last ten years (1991 to 2000) in the third quarter.

- **Higher than normal particulate levels were measured in southern and central Alberta from August 11 to August 22.** These elevated levels were caused by smoke from forest fires in southern British Columbia. The highest fine particulate ($PM_{2.5}$) concentrations were measured on August 22 when the daily averaged values ranged from 26.8 to 30.4 $\mu g/m^3$ (micrograms per cubic metre) in Edmonton, Red Deer and Calgary. The Canada-wide Standard benchmark for $PM_{2.5}$ of 30 $\mu g/m^3$ was just barely exceeded at the Edmonton Northwest station on August 22.

- **Air quality guidelines for hydrogen sulphide were exceeded at the Calgary East and Edmonton East stations.** The one-hour guideline was exceeded 30 times at the Calgary East station and twice at the Edmonton East station. Elevated hydrogen sulphide levels at the Calgary East station were due to emissions from the nearby sewage treatment plant. Exceedances at the Edmonton East station were likely caused by leakages from petroleum storage tanks or transport vehicles.

- **Continued decreasing levels of carbon monoxide were noted at all Edmonton and Calgary stations.** Carbon monoxide concentrations at Edmonton and Calgary stations were 19 to 51 per cent lower than the average levels over the previous ten years (1991 to 2000). The major source of carbon monoxide is vehicle exhaust emissions. Lower carbon monoxide levels are primarily due to better emission control systems on newer vehicles.

## Number of Times Air Quality Guidelines were Exceeded - July to September, 2001

| Station | Carbon Monoxide | | Dust and Smoke | Hydrogen Sulphide | | Nitrogen Dioxide | | Ozone | Particulate | Sulphur Dioxide | | Ammonia |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-hour | 8-hour | monthly | 1-hour | 24-hour | 1-hour | 24-hour | 1-hour | 24-hour $PM_{2.5}$ | 1-hour | 24-hour | 1-hour |
| Edmonton Central | 0 | 0 | 0 | na | na | 0 | 0 | 0 | 0 | na | na | na |
| Edmonton Northwest | 0 | 0 | 0 | na | na | 0 | 0 | 0 | 1 | na | na | na |
| Edmonton East | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | na |
| Calgary Central | 0 | 0 | 0 | na | na | 0 | 0 | 0 | 0 | na | na | na |
| Calgary Northwest | 0 | 0 | 0 | na | na | 0 | 0 | 0 | na | na | na | na |
| Calgary East | 0 | 0 | 0 | 30 | 5 | 0 | 0 | 0 | na | 0 | 0 | na |
| Red Deer | 0 | 0 | na | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | na |
| Fort Saskatchewan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | na | 0 | 0 | 0 |
| Beaverlodge | na | na | na | na | na | 0 | 0 | 0 | na | 0 | 0 | na |
| Guideline | 13 ppm | 5 ppm | 90% of values< 1 COH unit | 0.01 ppm | 0.003 ppm | 0.212 ppm | 0.106 ppm | 0.082 ppm | 30 µg/m3 * | 0.172 ppm | 0.057 ppm | 2.0 ppm |

na Parameter not monitored at this location

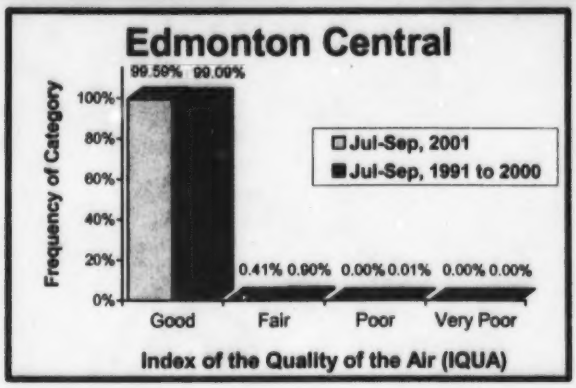
* The level and form of the achievement statistic specified the $PM_{2.5}$ Canada-wide Standard is 30 $\mu g/m^3$, for 24-hour averaging time, based on the 98th percentile annual value, averaged over three consecutive years (Canadian Council of Ministers of the Environment. 2001. Guidance Document on Achievement Determination. Canada-wide Standards for Particulate Matter (PM) and Ozone.)

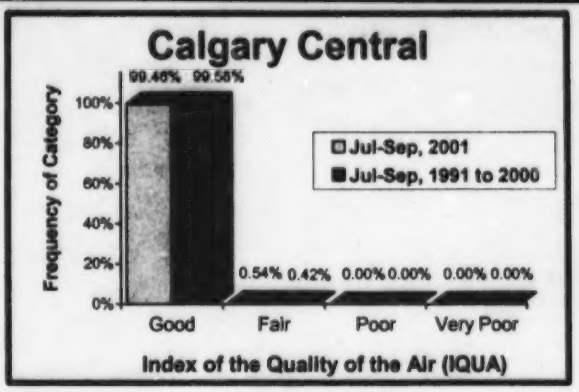
## The Index of the Quality of the Air

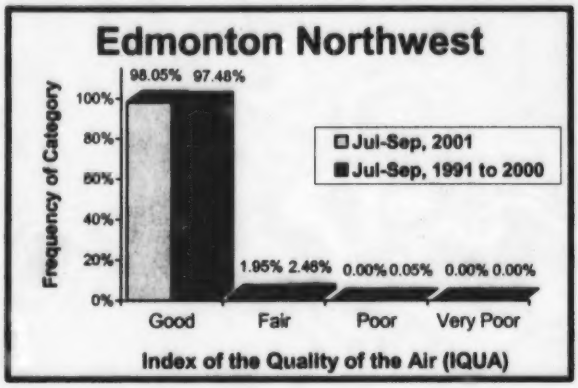
The index of the quality of the air (IQUA) provides the public with a meaningful measure of outdoor air quality. The IQUA is calculated every hour at all Edmonton, Calgary, Red Deer and Fort Saskatchewan monitoring stations. From this index, we can effectively rate air quality as Good, Fair, Poor or Very Poor. Air pollutants used to calculate the IQUA are carbon monoxide, dust and smoke, nitrogen dioxide, ozone and sulphur dioxide. Good, Fair, Poor and Very Poor air quality categories are directly related to guidelines under Alberta's *Environmental Protection and Enhancement Act*, and National Ambient Air Quality Objectives.

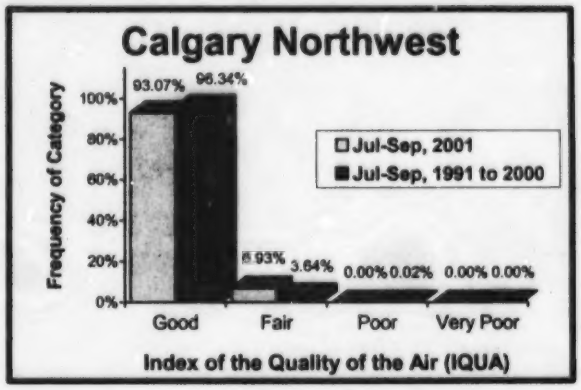
| IQUA rating | Description |
|---|---|
| **Good** | Desirable range: no known harmful effects to soil, water, vegetation, animals, materials, visibility or human health. The long-term goal is for air quality to be in this range all of the time in Canada. |
| **Fair** | Acceptable range: adequate protection against harmful effects to soil, water, vegetation, animals, materials, visibility and human health. |
| **Poor** | Tolerable range: not all aspects of human health or the environment are adequately protected from possible adverse effects. Long-term control action may be necessary, depending on the frequency, duration and circumstances of the readings. |
| **Very Poor** | Intolerable range: in this range, continued high readings could pose a risk to public health. |

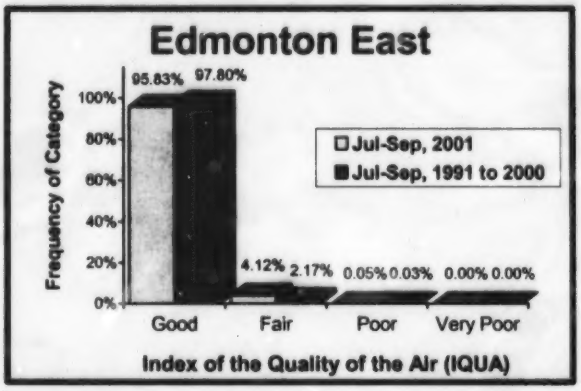
Source: Environment Canada. 1980. Guideline for a short-term air quality index. A report by the Federal-Provincial committee on Air Pollution.

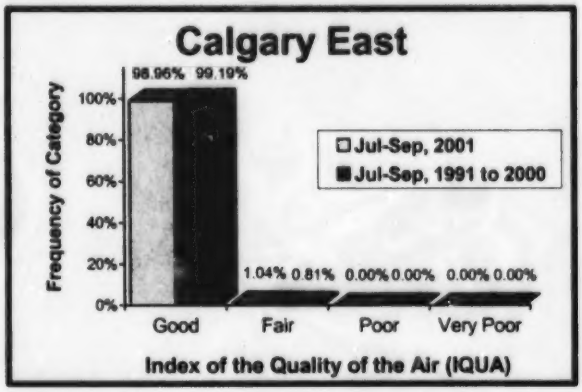


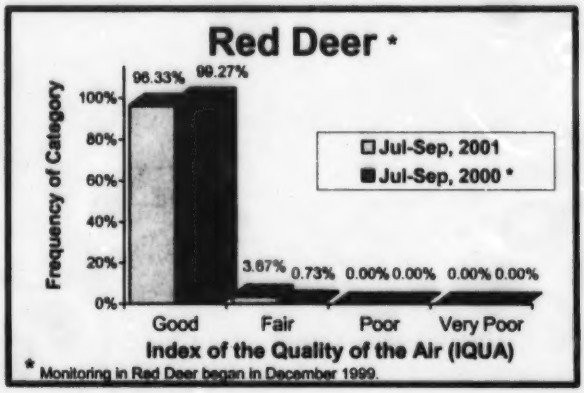



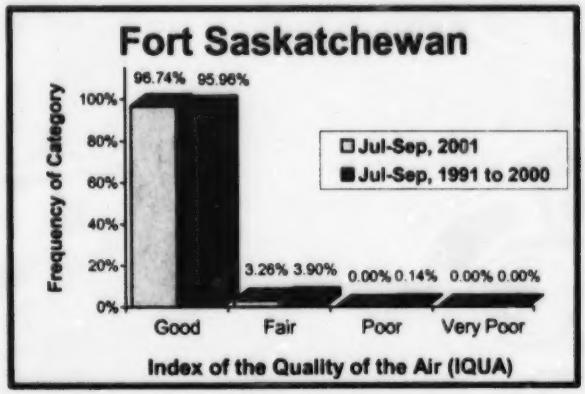




* Monitoring in Red Deer began in December 1999.



## Average Concentrations - July to September, 2001 [a]

| Parameter | Monitoring Period | Edmonton Stations | | | Calgary Stations | | | Red Deer [b] | Fort Saskatchewan | Beaverlodge [c] |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Central | Northwest | East | Central | Northwest | East | | | |
| Carbon Monoxide | Jul-Sep 2001 | 0.36 | 0.53 | 0.26 | 0.40 | 0.29 | 0.51 | 0.28 | 0.21 | na |
| (ppm) | Jul-Sep 1991-2000 | 0.69 | 0.65 | 0.39 | 0.82 | 0.49 | 0.66 | 0.12 | 0.38 | na |
| Dust and Smoke | Jul-Sep 2001 | 0.10 | 0.14 | 0.15 | 0.22 | 0.11 | 0.28 | na | 0.08 | na |
| (COH unit) | Jul-Sep 1991-2000 | 0.18 | 0.17 | 0.19 | 0.20 | 0.08 | 0.24 | na | 0.10 | na |
| Hydrogen Sulphide | Jul-Sep 2001 | na | na | 0.001 | na | na | 0.002 | 0.000 | 0.000 | na |
| (ppm) | Jul-Sep 1991-2000 [b] | na | na | 0.001 | na | na | 0.001 | 0.000 | 0.000 | na |
| Nitrogen Dioxide | Jul-Sep 2001 | 0.021 | 0.018 | 0.015 | 0.021 | 0.012 | 0.019 | 0.008 | 0.008 | 0.002 |
| (ppm) | Jul-Sep 1991-2000 | 0.020 | 0.016 | 0.013 | 0.024 | 0.012 | 0.021 | 0.008 | 0.008 | 0.002 |
| Ozone | Jul-Sep 2001 | 0.017 | 0.020 | 0.023 | 0.019 | 0.027 | 0.020 | 0.022 | 0.022 | 0.026 |
| (ppm) | Jul-Sep 1991-2000 | 0.017 | 0.019 | 0.021 | 0.016 | 0.023 | 0.018 | 0.019 | 0.022 | 0.025 |
| Sulphur Dioxide | Jul-Sep 2001 | na | na | 0.002 | na | na | 0.002 | 0.000 | 0.001 | 0.000 |
| (ppm) | Jul-Sep 1991-2000 [d] | na | na | 0.002 | na | na | 0.003 | 0.000 | 0.001 | 0.000 |
| Total Hydrocarbons | Jul-Sep 2001 | 1.83 | 2.36 | 2.33 | 2.00 | 1.87 | 2.06 | 2.27 | 1.82 | na |
| (ppm) | Jul-Sep 1991-2000 | 1.99 | 1.96 | 2.30 | 2.05 | 1.95 | 2.06 | 2.27 | 1.88 | na |
| Particulate | Jul-Sep 2001 | na | 24.4 | na | 25.4 | na | na | na | na | na |
| ($PM_{10}$ in $\mu g/m^3$) | Jul-Sep 1994-97 [e] | na | 24.9 | 25.6 | 27.3 | na | na | 21.5 | na | na |
| Particulate | Jul-Sep 2001 | 8.6 | 12.0 | 10.2 | 10.3 | na | na | 9.4 | na | na |
| ($PM_{2.5}$ in $\mu g/m^3$) | Jul-Sep 1998 [f,g] | na | 13.7 | 10.2 | 11.8 | na | na | na | na | na |
| Ammonia | Jul-Sep 2001 | na | na | na | na | na | na | na | 0.001 | na |
| (ppm) | Jul-Sep 1991-2000 | na | na | na | na | na | na | na | 0.003 | na |

## Maximum One-Hour Concentrations - July to September, 2001 a

| Parameter | Edmonton Stations | | | Calgary Stations | | | Red Deer | Fort Saskatchewan | Beaverlodge | One-Hour Guideline |
|---|---|---|---|---|---|---|---|---|---|---|
| | Central | Northwest | East | Central | Northwest | East | | | | |
| Carbon Monoxide (ppm) | 2.9 | 4.8 | 1.5 | 3.6 | 2.8 | 3.7 | 1.3 | 1.3 | na | **13.0** |
| Dust and Smoke (COH Unit) | 1.9 | 1.3 | 1.6 | 2.2 | 0.9 | 3.3 | na | 0.9 | na | **na** |
| Hydrogen Sulphide (ppm) | na | na | 0.022 | na | na | 0.038 | 0.009 | 0.003 | na | **0.010** |
| Nitrogen Dioxide (ppm) | 0.086 | 0.065 | 0.068 | 0.058 | 0.055 | 0.086 | 0.034 | 0.039 | 0.014 | **0.212** |
| Ozone (ppm) | 0.060 | 0.071 | 0.083 | 0.058 | 0.066 | 0.062 | 0.073 | 0.080 | 0.059 | **0.082** |
| Sulphur Dioxide (ppm) | na | na | 0.024 | na | na | 0.028 | 0.011 | 0.018 | 0.009 | **0.172** |
| Total Hydrocarbons (ppm) | 2.8 | 4.6 | 25.0 | 2.9 | 2.7 | 3.5 | 5.0 | 3.1 | na | **na** |
| Particulate ($PM_{10}$ in $\mu g/m^3$) | na | 147 | na | 117 | na | na | na | na | na | **na** |
| Particulate ($PM_{2.5}$ in $\mu g/m^3$) | 89 | 53 | 81 | 55 | na | na | 50 | na | na | **na** |
| Ammonia (ppm) | na | na | na | na | na | na | na | 0.008 | na | **2.0** |

a All average and maximum values based on data collected from July to September.
b Hydrogen sulphide monitoring began in February 1991 at the Edmonton East station.
c Monitoring at the Beaverlodge station began in November 1997.
d Sulphur dioxide monitoring began in February 1999 at the Beaverlodge station.
e $PM_{10}$ monitoring began in January 1996 at the Calgary Central station and November 1993 at the Edmonton Northwest station.
f The $PM_{10}$ monitor at the Edmonton East station was converted to $PM_{2.5}$ in August 2000. The $PM_{10}$ monitor at the Red Deer station was converted to $PM_{2.5}$ in December 2000.
g $PM_{2.5}$ monitoring began in November 1997 at the Calgary Central station, July 1998 at the Edmonton Northwest station and October 2000 at the Edmonton Central station.
h Monitoring at the Red Deer station began in December 1999.
na Parameter not monitored at this location or no one-hour guideline for parameter.